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SYSTEMATICS OF SKINKS OF THE *EUMECES* *BREVIROSTRIS* SPECIES GROUP IN WESTERN MEXICO¹

By Michael D. Robinson²

ABSTRACT: The *Eumeces brevirostris* species group as defined here contains seven species, one of which, *brevirostris*, is polytypic. Two taxa formerly allocated to the *multivirgatus* species group, *E. parviauriculatus* and *E. parvulus*, are placed in the *brevirostris* species group. The only character that distinguishes these supraspecific assemblages is the shape of the scale that medially borders the postgenial. It is wider than long in all species of the *brevirostris* group, but it is longer than wide in those of the *multivirgatus-brevilineatus* complex. Morphological variation, distribution, and ecology are summarized for the *brevirostris* group taxa in western Mexico (*E. brevirostris bilineatus*, *E. parviauriculatus*, *E. parvulus*, and *E. colimensis*).

Eumeces copei appears to have the ancestral scalation and color pattern of the *brevirostris* group, and the remaining species have character states derivable from it. The distribution of the group suggests that dispersal occurred from the Central Highlands and Trans Volcanic region of Mexico into forest and woodland habitats of the Sierra Madre Occidental and Oriental and the Sierra Madre del Sur.

In addition, scale and pattern comparisons of the syntypes of *E. humilis*, a taxon in the *multivirgatus-brevilineatus* complex, are made with *E. callicephalus* and *E. multivirgatus*; these data indicate that *E. humilis* is conspecific with and a junior synonym of *E. callicephalus*.

INTRODUCTION

In 1933 Taylor described two species of skinks, *Eumeces parviauriculatus* and *E. parvulus*, from four specimens collected in northwestern Mexico. In his monographic review of this genus (1935) and in a subsequent paper (1943), Taylor (1935:38) included these two species in the *multivirgatus* species group (although with reservations). During the next 36 years a few additional specimens were reported (Oliver 1937; Smith 1943; Peters 1954; Legler and Webb 1960; Duellman 1961; and Hardy and McDiarmid 1969), but no evaluation of interspecific and species group relationships of these skinks has been attempted. Until now, Taylor's (1935) species group arrangements have been maintained (e.g., Tanner 1957; Dixon 1969). Larger series of these and related species of montane skinks from northwestern Mexico have become available, making possible a reassessment of their relationships.

SPECIES GROUP DEFINITIONS

In the accounts below, the cephalic scale nomenclature used is that of Taylor (1935:71), but the designations for longitudinal and transverse scale rows and lateral body stripes are those outlined by Dixon (1969). Of the 27 scale and meristic characters analyzed, those most useful taxonomically are listed in Tables 1–4. A total of 151 specimens were analyzed (see Specimens Examined).

During the initial stages of this study it was apparent that Taylor's (1935) placement of *parvulus* and *parviauriculatus* with the *multivirgatus* species group was questionable. Many of the characters used by Taylor to define the *multivirgatus*, *brevilineatus*, and *brevirostris* groups are not exclusive (Table 1), and therefore

his definitions are too broad. Dixon (1969) accepted the majority of Taylor's (1935) definitions in his review of the *brevirostris* group.

When "diagnostic" characters of the species groups are compared (Table 1), two main points become obvious: first, there is no single character or combination of characters that will separate the *multivirgatus* and *brevilineatus* species groups; second, the only unequivocal character that unites skinks of the *brevirostris* group is the shape of the scale that medially borders the postgenial (not following it, *vide* Dixon 1969). This scale is wider than long in all *brevirostris* group taxa, but it is longer than wide in skinks of the *multivirgatus* and *brevilineatus* groups (Fig. 1). Three other characters are shared by members of the *brevirostris* group, but they also occur occasionally in taxa of the *multivirgatus* and *brevirostris* groups. These are the lack of a postnasal scale and median dorsal light stripe and the presence of a single postmental.

Data from this study indicate that the *brevirostris* group should be expanded to include *E. parviauriculatus* and *E. parvulus*, and that the *multivirgatus* and *brevilineatus* species groups be com-

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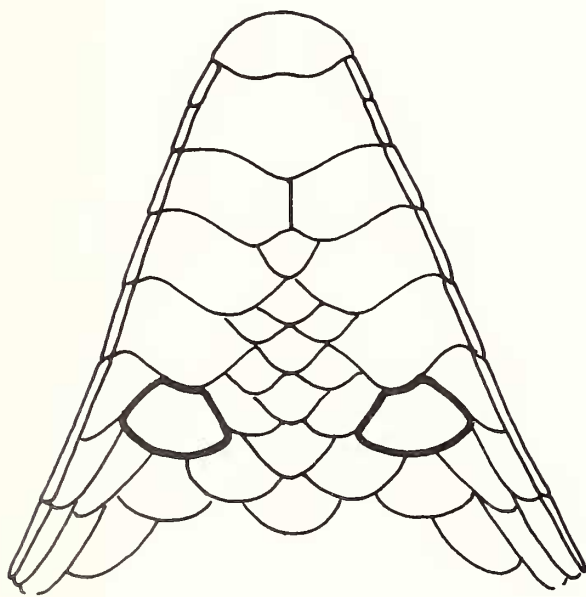
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TABLE 1

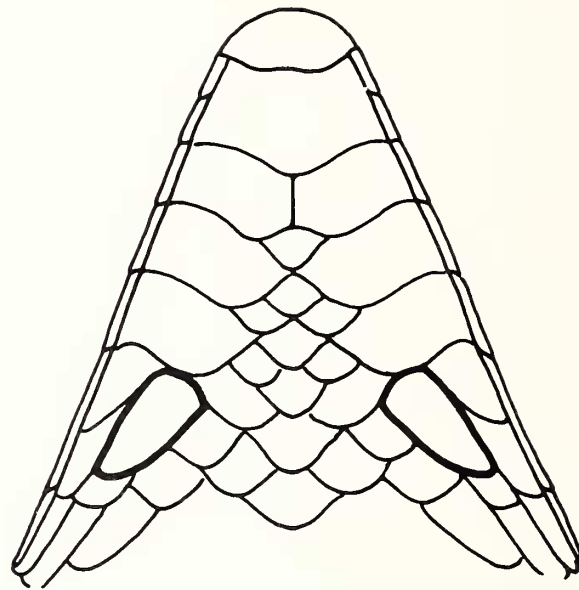
Scale and pattern character states used to distinguish skinks in the *Eumeces brevirostris*, *multivirgatus*, and *brevilineatus* species groups.

	<i>Brevirostris</i> Group			<i>Multivirgatus</i> Group		<i>Brevilineatus</i> Group	
	Taylor (1935)	Dixon (1969)	This Report	Taylor (1935)	This Report	Taylor (1935)	This Report
Scale Medial to Postgenial ^a	W	W	W	L	L	L	L
Postmental	1	1	1	1-2	1-2	1-2	1-2
Postnasal	0	0	0	0-1	0-1	0	0-1
Med. Light Line	none	none	none	var.	var.	pres.	var.
Dorsolat. Light Line	var.	var.	var.	var.	var.	pres.	var.
Long. Scale Rows	22-28	20-28	20-28	20-26	24-28	24-28	26-30

^a W = wider than long; L = longer than wide.



A



B

FIGURE 1. Shape of the scale medial to the postgenial in members of a) the *Eumeces brevirostris* group and b) the *multivirgatus* and *brevilineatus* groups.

bined (Table 1). Both *parviauriculatus* and *parvulus* have a scale medial to the postgenal that is wider than long, lack postnasal scales and a median dorsal stripe, and have a single postmental scale. Therefore, I have removed them from Taylor's (1935, 1943) *multivirgatus* group and include them with those species previously listed by Dixon (1969) as belonging to the *brevirostris* group. With this arrangement the *brevirostris* group contains seven species, one of which is polytypic:

E. brevirostris brevirostris (Günther)

E. b. bilineatus Tanner

E. b. dicei Ruthven and Gaige

E. b. indubitus Taylor

E. b. pineus Axtell

E. colimensis Taylor

E. copei Taylor

E. dugesii Thominot

E. ochoteranae Taylor

E. parviauriculatus Taylor

E. parvulus Taylor

The following accounts summarize and compare the scalation, color and pattern (Fig. 3, Tables 1–3), the known geographic distributions (Figs. 2, 4), and the ecological information for those taxa reaching northwestern Mexico (*b. bilineatus*, *parvulus*, and *parviauriculatus*). Holotypes were examined for *parviauriculatus*, *parvulus*, *brevirostris bilineatus*, and *humilis*. Comparisons with other taxa in the *brevirostris* group are made where existing keys and diagnoses are insufficient. In addition, the uncertain identity of a specimen of *E. colimensis* is discussed, and the taxonomic status of *E. humilis* is reviewed.

Eumeces brevirostris bilineatus Tanner

This subspecies of *brevirostris* was described by Tanner (1958) from specimens collected in montane regions of western Durango and southwestern Chihuahua. Dixon's (1969) analysis of variation in pattern and squamation of this taxon agree closely with the data presented here (Tables 2, 3) and will not be repeated. New comparisons with *parviauriculatus* and *parvulus* are made, and a zone of intergradation with *E. b. indubitus* is discussed.

COMPARISONS: A few species in the *brevirostris* group can be distinguished by the number of scales between the adpressed limbs (e.g., *parviauriculatus*, *colimensis*, and *brevirostris*). However, considerable ontogenetic variation exists in this character, and it is difficult to determine accurately on some preserved specimens. Juveniles ($s-v < 40$ mm) of *bilineatus* consistently have fewer scales between adpressed limbs (0–3) than *parvulus* (8–21) or *parviauriculatus* (11–18). In adults this distinction is less clear between these species (Table 2), making identification by this character alone unreliable.

The frontonasal contacts the nasal less frequently in *bilineatus* (77%) than in *parvulus* (100%) or *parviauriculatus* (93%). Like *parvulus*, the interparietal scale of *bilineatus* is always enclosed by the parietal scales, but rarely so (3.4%) in *parviauriculatus*. In *bilineatus* the primary temporal is often absent (58.9%), and, when present, it seldom (17.4%) contacts the lower secondary temporal. All individuals of *parvulus* and *parviauriculatus* have a primary temporal scale that contacts the lower secondary temporal. The seventh supralabial contacts the upper secondary temporal in most specimens of *bilineatus* (92.8%), but never in *parvulus* or *parviauriculatus* (Table 3).

Dixon (1969) concluded that *bilineatus* differs from *indubitus*

by the lack of a longitudinal lateral light line on the neck, by the grading of the whitish color of longitudinal scale rows 5 or 6 into the white color of the belly, and by the dorsolateral light line usually extending to the tail or beyond. In contrast, *indubitus* has a longitudinal light line on the neck, the dark color below it extends laterally to the belly, and the dorsolateral light stripe becomes faint near the shoulder. One of Tanner's (1958) paratypes of *bilineatus* (USNM 64666), from the Sierra Juanacatlan, Jalisco, has these three characters of *indubitus*. Three specimens (MSU 4162, 7260, 7877) from Cueva and Pericas Summit, Durango, and from near Atenquique, Jalisco, have pattern features of both *bilineatus* and *indubitus*. They lack a longitudinal lateral line on the neck, the dark neck color extends onto the venter, and the dorsolateral line extends only to the shoulder. Two individuals (MSU 4163, 4165) collected near the type locality of *bilineatus* have patterns typical of *indubitus*. These six specimens suggest that the type locality of *bilineatus* is in a zone of intergradation with *indubitus*. The limits of this zone are unknown and must await additional material from the remote region between southern Durango and northwestern Jalisco.

DISTRIBUTION AND ECOLOGY: This race lives in the Sierra Madre Occidental from the vicinity of Mojarachic, Chihuahua to southern Durango (Fig. 2). The northern extent of the range is not established, but considerable collecting in appropriate habitats of northern Chihuahua and central Sonora have failed to produce specimens.

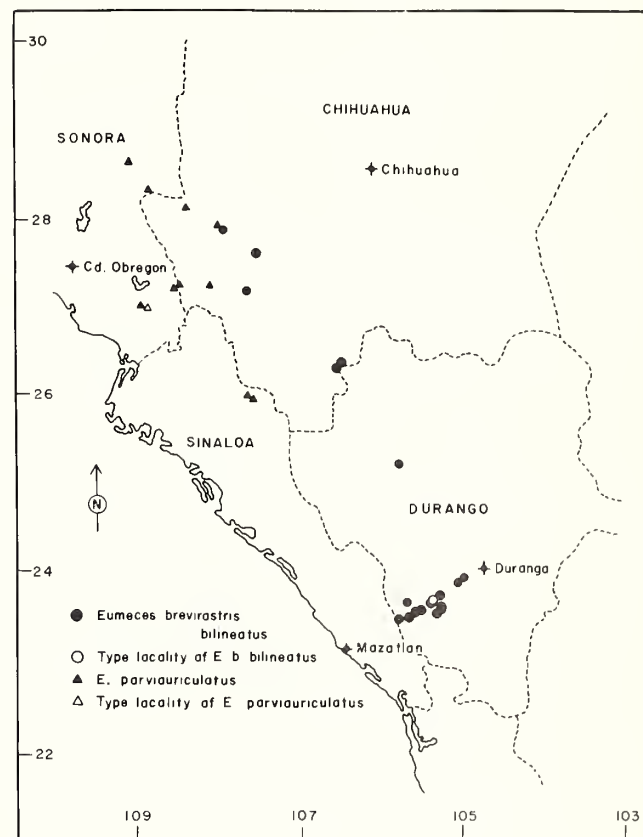


FIGURE 2. Geographic distribution of *Eumeces parviauriculatus* and *E. brevirostris bilineatus* in northwestern Mexico.

TABLE 2

Variation of four scale character states in four taxa of the *Eumeces brevirostris* species group from western Mexico. Statistics are mean, $\pm$ standard error of mean, range, and sample size. Data for *E. b. indubitus* are from Dixon (1969; Jalisco).

	<i>E. brevilineatus indubitus</i>	<i>E. brevilineatus bilineatus</i>	<i>E. parvulus</i>	<i>E. parviauriculatus</i>
Transverse	60.1 $\pm$.36	59.6 $\pm$.29	60.3 $\pm$.59	63.5 $\pm$.32
Scale Rows	56 – 68 51	55 – 63 54	55 – 62 12	61 – 66 26
Longitudinal	24.8 $\pm$.15	23.8 $\pm$.10	23.3 $\pm$.34	20.0 $\pm$.00
Scale Rows	22 – 26 51	22 – 25 56	22 – 26 15	20 29
Fourth Toe	13.4 $\pm$.17	10.2 $\pm$.11	11.1 $\pm$.27	10.2 $\pm$.12
Lamellae	11 – 16 51	9 – 13 56	10 – 12 16	9 – 11 29
Scales Between Adressed Limbs				
All	—	9.1 $\pm$.55	14.2 $\pm$ 1.14	16.1 $\pm$.64
	—	0 – 16	8 – 21	10 – 22
	—	51	14	28
s-v > 40mm	—	9.9 $\pm$.44	15.6 $\pm$ 1.21	17.2 $\pm$.60
	—	2 – 16	10 – 21	10 – 22
	—	45	9	21
s-v < 40mm	—	1.0 $\pm$.51	13.0 $\pm$ 2.17	12.9 $\pm$ 1.12
	—	0 – 3	8 – 21	11 – 18
	—	6	5	7

These skinks are commonly found under rocks, logs, and leaf litter in woodland (oak and oak-pine) and forest (pine and pine-fir) communities of 1500 to 2500 meters. At Mojarachic, Chihuahua (Fig. 2), *bilineatus* (UMMZ 117756) is sympatric with *parviauriculatus* (FMNH 106476) and *callicephalus* (Taylor and Knobloch 1940), and approximately 65 km southeast of there, near Creel, Chihuahua, both *E. multivirgatus* and *E. multilineatus* (*sensu lato*) have been collected (Legler and Webb 1960). Unfortunately, the ecological interrelationships of these five montane skinks in this area is not yet clear.

Eumeces parvulus Taylor

This species was described in 1933 by Taylor from three specimens collected in Nayarit and Sinaloa. It appears only fourteen more have been collected subsequently, but several workers have remarked on the differences between their samples and the holotype (Oliver 1937; Smith 1943; Peters 1954; Duellman 1961; Hardy and McDiarmid 1969). Variation in the scalation and pattern of the 17 specimens known to me is discussed below and summarized in Tables 2 and 3 and Fig. 3.

COMPARISONS: There are no significant differences between *bilineatus*, *parvulus* and *indubitus* in the number of longitudinal

or transverse scale rows, but *parviauriculatus* has distinctly fewer longitudinal and more transverse rows (Table 2). My counts of the number of fourth toe lamellae are one or two fewer than those reported for *indubitus* (Dixon 1969), probably from differences in our counting techniques. As juveniles (s-v < 40mm), *parvulus* has shorter limbs than *bilineatus*, but this distinction is less clear in adults (p. 5'). In cephalic scale features (Table 3), *bilineatus*, *parvulus*, and *indubitus* are similar, all having four supraoculars and an enclosed interparietal scale. Nor are there notable differences between them in the incidence of contact of the fronto-nasal with the frontal, or the seventh supralabial with the upper secondary temporal. The primary temporal is lacking on both sides in 58.9% of the specimens of *bilineatus*, but it is rarely absent in *indubitus* and *parvulus* (Table 3).

Eumeces parvulus is a more uniformly colored species than either *bilineatus* or *parviauriculatus*. Both the venter and dorsum of preserved specimens are uniformly pale yellow-brown (straw color), occasionally with a faint greenish cast (light olive-green). Peters (1954) described the ventral body color of a live animal as "greenish grey." The chin was yellow, while the appendages were colored similar to the body. Another live lizard had a pale blue tail, and its dorsolateral stripe was a "pale pinkish tan" (Duellman 1961).

TABLE 3

Percent of occurrence of ten cephalic scale character states in four taxa of the *Eumeces brevirostris* species group. Data for *E. b. indubitus* are from Dixon (1969; Jalisco).

	<i>E. brevirostris</i> <i>indubitus</i> (N=51)	<i>E. brevirostris</i> <i>bilineatus</i> (N=56)	<i>E. parvulus</i> (N=17)	<i>E. parviauriculatus</i> (N=27)
Frontonasal Contacts				
Frontal	37	77	100	93
Four Supraoculars (on both sides)	100	100	100	100
Three Supraoculars Border Frontal	93	99	68	96
Interparietal Enclosed	94	100	100	3
Postnasal Absent	—	100	100	100
Postmental Single	—	98	100	100
Scale Medial to Postgenial wider than long	—	100	100	100
Primary Temporal Present	99	41	100	100
Primary Temporal Contacts Lower Secondary Temporal	—	17	100	100
7th Supralabial Contacts Upper Secondary Temporal	98	93	00	00

The dorsolateral stripe arises near the rostral scale and occupies scale rows 2 and 3 posteriorly. It is short, never reaching much past the shoulder (Fig. 3). The lateral light line is seldom visible on preserved animals, but on those I examined from Michoacan it blended ventrolaterally with the color of the venter as in *bilineatus*.

Some characters of scutellation and pattern (Tables 2, 3) suggest that *parvulus* could be a geographic race of the polytypic species *brevirostris*. However, *parvulus* differs from all subspecies of *brevirostris* by lacking any contact between the seventh supralabial and the upper secondary temporal, a condition shared with *parviauriculatus* and to some extent *copei* (10% contact). Areas of sympatry between *parvulus* and other *brevirostris* group skinks are not known (Fig. 4), but the few specimens of *parvulus* from areas of potential contact have no indication of intergradation with *indubitus* or *bilineatus*. Thus, pending data to the contrary, I have retained specific status for *parvulus*.

DISTRIBUTION AND ECOLOGY: *Eumeces parvulus* appears restricted to the foothills and lowlands west of the Sierra Madre Occidental and south of the Trans Volcanic Range in the coastal states of Sinaloa, Nayarit, Colima and Michoacan (Fig. 4). The range disjunctions in coastal Jalisco and northern Nayarit probably result from lack of exploration.

The limited ecological data available for *parvulus* (Oliver

1937; Duellman 1961; Hardy and McDiarmid 1969) indicate that it occurs in lower elevation (<500 m) tropical broadleaf forests in Nayarit, Colima, and Michoacan, and in the higher elevation (ca. 1000 m) transitional communities (oak woodland and oak-pine woodland) in Sinaloa and Nayarit.

Eumeces parviauriculatus Taylor

Since the description of this species (Taylor 1933), three additional specimens, also from Chihuahua, have been reported (Taylor and Knobloch 1940; Legler and Webb 1960). McDiarmid *et al.* (1976) discussed the variation in the first specimens recorded from Sinaloa. This analysis summarizes the data from the 29 specimens now available.

COMPARISONS: The number of transverse scale rows is slightly higher in *parviauriculatus* than in *bilineatus* or *parvulus*, and the number of fourth toe lamellae is slightly lower (Table 2). The consistently low number of longitudinal scale rows (20) is characteristic of *parviauriculatus*; *copei* and *ochoterenae* occasionally have 20 scales in the longitudinal series (Dixon 1969), but they both differ from *parviauriculatus* in the length and position of the lateral and dorsolateral stripes. Members of the species have a high number of scales between adpressed limbs

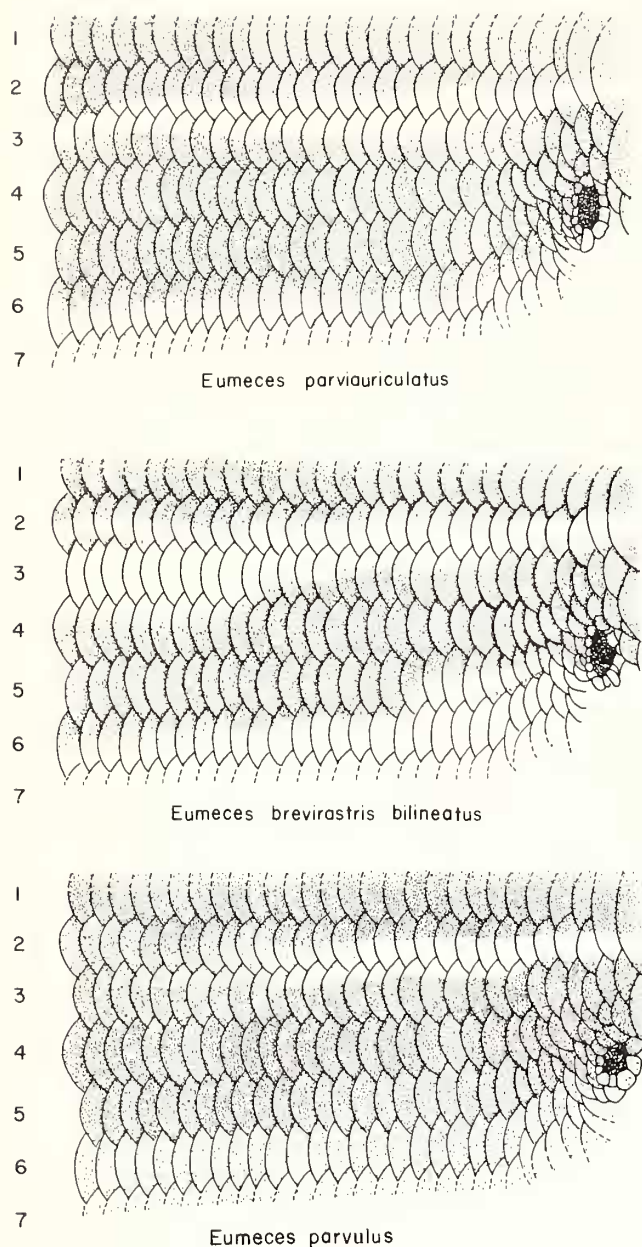


FIGURE 3. Lateral stripe patterns of three species of *Eumeces* from northwestern Mexico. View is the right lateral region of the neck and mid-body. *E. parviauriculatus*, Sonora (UAZ 28123); *E. b. bilineatus*, Durango (MSU 9375); *E. parvulus*, Michoacan (UMMZ 104447).

throughout ontogeny, and in this respect are distinctive from *bilineatus* (Table 2).

As in *parvulus*, the primary temporal is present and contacts the lower secondary temporal in all specimens; the seventh supralabial never contacts the upper secondary temporal. The fronto-nasal usually (93%) borders the frontal, and the interparietal is rarely enclosed (3.4%). Like other members of the *brevirostris* group, *parviauriculatus* lacks postnasals and a median white stripe, has a single postmental, and the scale medially bordering the postgenial is wider than long (Table 3). Taylor (1933) remarked that this species has a distinctly small ear opening due to

the overlapping postlabial scales. Although this condition is usually apparent, it is difficult to quantify and compare to other taxa.

The narrow dorsolateral stripe is confined to scale rows 2 and 2-3 near the nape and then to the upper half of row 3 to the rump and beyond (Fig. 3). This dorsolateral stripe formula is similar to that in *copei*, some *b. brevirostris*, and *ochoterenae* (Dixon 1969), but in these lizards this stripe does not extend onto the tail. The lateral light line extends to the shoulder on scale rows 6 and 7, and is shorter than in either *copei*, *ochoterenae*, or *b. brevirostris*. The tail is a brilliant metallic blue in young lizards but less striking in adults. Legler and Webb (1960) described the body color and pattern of a juvenile. The live adult animals that I have seen from southern Sonora differ only in having less contrast between the light stripes and the background color.

The long slender body and short legs of *parviauriculatus* are manifested in its reduced number of longitudinal scale rows, higher counts of transverse scales, and greater number of scales between adpressed limbs.

DISTRIBUTION AND ECOLOGY: This species inhabits the higher mountainous regions (1500–2300 m) of southeastern Sonora, southwestern Chihuahua, and northeastern Sinaloa (Fig. 2).

Attempts to locate this skink north of the northernmost known locality near Bamuri, Sonora, have failed, and to my knowledge appropriate habitats south of the known Sinaloan localities have not been sampled. Geographic overlap with *bilineatus* occurs at

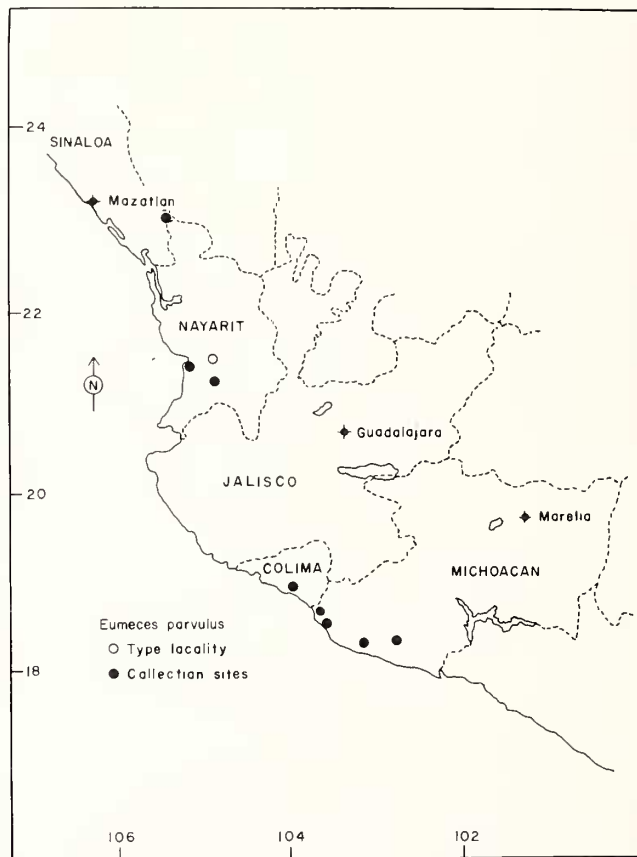


FIGURE 4. Geographic distribution of *Eumeces parvulus* in western Mexico.

TABLE 4

Scale and pattern character states of *Eumeces colimensis*, KU 44733, and *E. callicephalus*.

	<i>colimensis</i>	KU 44733	<i>callicephalus</i>
Scale Medial to Postgenial	wider than long	wider than long	longer than wide
Lower Secondary Temporal	absent	absent	absent
Postlabials	2	2	1 (.93)
Size of 6th and 7th Supralabials	7th largest (except on type)	7th largest	Approx. equal
Length of Lateral Light Line	obscure at midbody	supralabials to tail	variable
Dorsolateral Stripe			
Scale Row Formula	2, 3, 4, 5	2-3	2, 3, 4

Mojarachic, Chihuahua (Fig. 2), but the remaining *parviauriculatus* localities are on mountains that are western outliers from the main Sierra Madre cordillera.

Taylor (1933) designated the type locality of *parviauriculatus* as Alamos, Sonora (presumably the town), but in view of what is now known of its ecological distribution and from unsuccessful attempts to find it near the town, the holotype was most likely collected on the nearby Sierra Alamos where it lives today.

These skinks, which inhabit the semi-tropical evergreen oak woodland and pine forest, are more frequently observed at the beginning of the summer rains in late June or early July, and are found under logs, rocks, and leaf litter, especially at riparian localities.

Two additional systematic problems are considered next and involve the questioned identity of a single specimen of *E. colimensis* from Sinaloa and the uncertain status of *E. humilis*.

Eumeces colimensis Taylor

Only four specimens of this species are known, and all have considerable variation in the head scalation. Dixon (1969) questioned Webb's (1959) identification of a skink from southeastern Sinaloa (KU 44733) as *E. colimensis* because it differed from the three more southern specimens by having: 1) a well-defined lateral light line extending from the supralabials to the tail; 2) a dorsolateral light line confined to the lower half of scale row 2 and the upper two-thirds of row 3, instead of descending to rows 3, 4 and 5; and 3) a small primary temporal present, and a large seventh supralabial that contacts the upper secondary temporal. The seventh supralabial is smaller and the primary temporal is absent in the holotype. Dixon (1969) suggested that this specimen may be related to *callicephalus*.

Hardy and McDiarmid (1969) examined the same four specimens and concluded that KU 44733 was *E. colimensis*. They remarked that the type, which apparently is rather "atypical," differs from the other specimens by lacking a primary temporal

(fused with upper secondary temporal), by having a frontal-interparietal contact, and by having a greater amount of overlap of the adpressed limbs. Of the various scale and pattern characters (Table 4), the most significant is the shape of the scale that medially borders the postgenial (Fig. 1). In the KU specimen this scale is wider than long, and this precludes its assignment with *callicephalus* or any member of the *multivirgatus-brevirostris* group. The reduced size of the seventh supralabial in KU 44733 occurs occasionally in other species of *Eumeces*. The remaining deviations noted by Dixon (1969) involve the length and scale row position of the lateral lines, and these are characters known to vary intraspecifically in the *brevirostris* group. Therefore, I concur with Webb (1959) and Hardy and McDiarmid (1969) that the specimen is a *colimensis*. It may, however, represent an undescribed northern race of *colimensis*.

The nomenclatural history of *E. humilis* has been confusing. Boulenger (1883) applied the name *E. bocourtii* to two specimens collected in Mexico by Forrer from "Presidio," presumably the presidio near Mazatlan, Sinaloa (Kellogg 1932; Taylor 1935). Günther (1885) illustrated one of the syntypes. Since the name *bocourtii* was preoccupied by a New Caledonian species, Boulenger (1887) selected *E. humilis* as its replacement.

Mosauer (1932) and Taylor (1935) reported several skinks collected in southern Texas as *humilis*. Smith (1942) later demonstrated that these specimens differed from the syntypes of *humilis*, because they had a double postmental, widened subcaudals, and lacked dorsolateral light lines. He then described the Texas specimens as *E. taylori* (= *multivirgatus*) and corrected Mosauer's (1932) and Taylor's (1935) errors of considering the postmental single. The most recent reference to the name *humilis* was by Hardy and McDiarmid (1969:142) who relegated "... all specimens of *Eumeces* from the coastal lowlands ... to *E. callicephalus*."

Each syntype of *humilis* (BMNH 8.20.66-67) has a scale medial to the postgenial that is longer than wide, allying them with

the *multivirgatus-brevilineatus* complex (Table 5), not with the *brevirostris* group. The median preanal scales in both *multivirgatus* and *humilis* are of similar size and are noticeably larger than the adjacent scales overlapping them (in *callicephalus* the size is equal, or the median preanals are only slightly larger); there is no trace of a middorsal line on the head or body (it is nearly always present in *callicephalus*); the anterior median subcaudals are often 1.25 to 1.5 times wider than adjacent scales (they are approximately equal in size in *callicephalus*). I found the relative size of the anterior subcaudals to be variable within a sample and therefore a somewhat unreliable character. Similarity of *humilis* to *callicephalus* occurs in the equal size (height and width) of the sixth and seventh supralabials, whereas the seventh supralabial is wider than the sixth in *multivirgatus*.

The color pattern, which appears faded in the syntypes, is a uniform light olive-brown near the head, becoming a gray-green on the back. The throat is a pearly white. The venter has an infusion of brown from the dark-centered scales. There is no middorsal stripe, and the faint dorsolateral stripe extends from the labial region posteriorly to the front of the shoulder on scale rows 2-3, 3, 3-4, and 4. The dorsolateral light line is on these same scale rows in specimens of *callicephalus* and *multivirgatus* from Mexico (Table 5). With old or faded material it is difficult to distinguish between the few *callicephalus* that lack a middorsal stripe and the weakly striped morphs of *multivirgatus*. Thus the pattern of the syntypes could be either and offers little help toward identification of these specimens.

My first inclination was that *humilis* was most similar to *multivirgatus*, but several factors make this choice unlikely. First, the supralabials, which are less variable than either subcaudal scales or color patterns, argue for a relationship with *callicephalus*. Second, there appears to be no reason to doubt Forrer's locality (see Kellogg 1932) for *humilis*, which is very close to where *callicephalus* has been collected recently (Zweifel 1962). Moreover, although Forrer collected in Durango and probably in habitats suitable for *multivirgatus* as well as *callicephalus*, the former is not yet known from either Durango or from lowland habitats west and south of the Sierra Madre Occidental.

A good deal of the confusion with the two *humilis* specimens is no doubt due to their age and the faded condition of their patterns. In the absence of additional material, the most parsimonious decision is to regard *humilis* as a synonym of *callicephalus*. A similar conclusion was reached by Stephens and Loomis (see Hardy and McDiarmid 1969).

EVOLUTIONARY AND BIOGEOGRAPHIC RELATIONSHIPS IN THE *BREVIROSTRIS* GROUP

As defined here, the *brevirostris* group contains seven species; six are monotypic and one, *brevirostris*, is polytypic containing five subspecies. With this redefinition, the group appears to be a monophyletic assemblage whose members all share several apparently derived pattern and scale characters (p. 3) that are distinct from other phyletic lineages within the genus. The intergroup relationships of *Eumeces* have not been analyzed since Taylor's (1935) initial study, and I can only repeat his suggestion that species of the *brevirostris* group seem most closely related to those in the *skiltonianus* group. My interpretations of several evolutionary trends and biogeographic patterns, involving mainly

the species of northwestern Mexico, are given below and are compared to previous hypotheses.

Although Dixon (1969) stated that *dugesii* is intermediate to the other species in a number of scale features and is unique in having only three supraoculars, he maintained that it may be the most primitive. He also hypothesized that *copei* and *ochoteranae* are the most specialized, even though the former species is the only one with what he considered (and I agree) to be the primitive color pattern. My view is that *copei* has the ancestral pattern and cephalic scalation, and that the remaining taxa in the *brevirostris* group have features derivable from those conditions.

Both *parviauriculatus* and *parvulus* share more cephalic scale features with *copei* than do any other *brevirostris* group taxa. Like *copei*, *parviauriculatus* has the interparietal scale free, lacks contact of the seventh supralabial with the upper secondary temporal, often has the frontonasal and nasal in contact, and has a primary temporal. The single pattern difference is the shortening of the lateral white line in *parviauriculatus*, and its body is longer and slimmer. Similarity of *parvulus* to *copei* is in the lack of contact between the seventh supralabial and the upper secondary temporal, the adjacent position of the frontonasal and nasal scales, and the presence of the primary temporal. *Eumeces parvulus* differs from *E. copei* in having an enclosed interparietal scale and greatly reduced dorsolateral and lateral light lines. In cephalic scalation and pattern, *parviauriculatus* has changed little from *copei* and therefore appears closely related to it, while more divergence has occurred in *parvulus*.

Fundamental to the biogeography of these skinks is their preference for montane or plateau forest or woodland habitats; even those living near sea level (*parvulus*) occur in lowland forest extensions of the coastal mountains. The distribution of the *brevirostris* group suggests that dispersal occurred from the Central Highlands and Trans Volcanic Range region of Mexico and radiated outward through suitable habitats of the major mountain chains, such as the Sierra Madre Occidental and Oriental and the Sierra Madre del Sur. The greatest species diversity (6 of the 11 taxa) is in the mountain and plateau region of Michoacan and Guerrero, and from there it decreases in all directions.

The known range of *parviauriculatus* (Fig. 2) implies that it might be a northwestern extension of a *copei* lineage that was previously more widely distributed in the main Sierra Madre Occidental. Perhaps *parviauriculatus* has been replaced by *brevirostris bilineatus* and is now mainly confined to satellite mountains (p. 8). It is likely that *parvulus* has a more continuous distribution along the coastal mountains of western Mexico (Fig. 3). This species seems to be a western derivative of *copei* that has adapted to the semi-tropical communities of the outlying coastal ranges.

SPECIMENS EXAMINED

The specimens analyzed in this study are deposited in the following collections: American Museum of Natural History (AMNH); University of Arizona (UAZ); British Museum Natural History (BMNH); Carnegie Museum (CM); Field Museum of Natural History (FMNH); Joseph F. Copp, private collection (JFC); University of Kansas (KU); Los Angeles County Museum of Natural History (LACM); Michigan State University (MSU); Museum of Vertebrate Zoology (MVZ); Robert G. Webb, private

TABLE 5

Scale and pattern character states of *Eumeces humilis* (Sinaloa), *E. multivirgatus* (Chihuahua), and *E. callicephalus* (Nayarit, Chihuahua, Sinaloa, and Sonora). Frequencies are expressed as decimals.

	<i>E. humilis</i> (N=2)		<i>E. callicephalus</i> ^a (N=11)	<i>E. multivirgatus</i> (N=5)
	BMNH 8.20.66	BMNH 8.20.67		
Scale Medial to Postgenial	longer than wide	longer than wide	longer than wide	longer than wide
Median Preanal Scales	largest	largest	approx. equal	largest
Middorsal Line	none	none	usually present	none
Postnasals	1-1	1-1	1 (.73) 0 (.27)	0-0 (.20) 0-1 (.40) 1-1 (.40)
Anterior Subcaudals	enlarged	enlarged	approx. equal	enlarged
Postmental	1	1	1 (.45) 2 (.55)	1 (.80) 2 (.20)
Postlabials	2	1	1 (.64) 2 (.36)	2 (1.00)
6th and 7th Supraoculars	equal height width	equal height width	equal height width	7th wider than 6th
Dorsolateral Stripe Scale Row Formula	2-3, 3 3-4, 4	2-3, 3 3-4, 4	2, 2-3, 3 3-4, 4	2, 2-3 3-4, 4

^aData for a larger sample (N=34) of *callicephalus* from Mexico (Carl Lieb, pers. comm.) indicates the frequency of (1) postnasals (at least one present), .86; (2) postmental divided, .63; and (3) postlabials single, .94.

collection (RGW); University of Michigan Museum of Zoology (UMMZ); United States National Museum (USNM).

Eumeces brevirostris bilineatus: MEXICO: Chihuahua: 24 km S and 9.6 km E Creel (KU 44262-63); 3.2 km W Samachique (KU 47429, 51324-25); Mojarachic (UMMZ 117756); Rio Verde (MVZ 59139). Durango: 16 km SW El Salto (KU 44732); 14.4-24 km SW El Salto (KU 44726-31); 4 km W San Luis (UMMZ 110905); Laguna del Progreso (UMMZ 113635-38); Hacienda Coyotes (UAZ 39501, UMMZ 113639, FMNH 1506); vic. Palo Gordo (CM 57909, UAZ 39495-500); 26 km E El Salto (AMNH 96609); 16 km E Llano Grande (RGW 5649-51); 2.4 km W San Luis (RGW 5665); 9.6 km SE Llano Grande (RGW 6100, 6117); Cueva, 12.8 km S El Salto (MSU 4162-5); 28.8 km SSW Tepehuanes (MSU 9370-5); Las Adjuntas (MVZ 59141, 59143, 59145, 59147, 59149, 59151); 16 km W El Salto (UAZ 38264).

Eumeces brevirostris indubitus: MEXICO: Jalisco: N slope Nevado de Colima (UAZ 31822, 31824-27); 3 km NE Talpa (KU 73744); Sierra Juanacatlan (USNM 64666); Nevado de Colima, 11.2 km W Atenquique (RGW 3304). Durango: Cueva, 12.8 km S El Salto (MSU 4163); 1.6 km ESE Cajones (MSU 4165).

Eumeces brevirostris indubitus X *Eumeces brevirostris bilineatus*: MEXICO: Jalisco: Nevado de Colima, 11.2 km W Atenquique (MSU 7260). Durango: Cueva, 12.8 km S El Salto (MSU 4162); 2.4 km E Peracas Summit (MSU 7877).

Eumeces colimensis: MEXICO: Sinaloa: 1.6 km E Santa Lucia (KU 44733).

Eumeces callicephalus: MEXICO: Chihuahua: 12.8 km W Matachic (AMNH 68295). Jalisco: Hostotipaquillo (AMNH 17943). Nayarit: Rosamorada (AMNH 15488); NW Santiago Ixcuintla (AMNH 19305-06); 8 km NE Sentispac (AMNH

87973–77); Laguna de Santa Maria del Oro (AMNH 96608). *Sinaloa*: 8.0 km N Mazatlan (AMNH 87672); Presidio (BMNH 1946.8.20.66–67). *Sonora*: Alamos (AMNH 64219).

Eumeces multivirgatus: MEXICO: *Chihuahua*: 7.2 km SE Galeana (UAZ 36306, 35924–26). *Coahuila*: 8.0 km W Cuatro Ciénegas (UAZ 38267).

Eumeces parviauriculatus: MEXICO: *Chihuahua*: 4.8 km NE Temoris (KU 51463–64); La Pulvosa (UMMZ 114502); Mojarachic (FMNH 106476). *Sinaloa*: 1.6 km SE Los Hornos (JFC 67–17, 67–18); 0.6 km N Los Hornos (JFC 68–104); 4.3 km SE Los Hornos (JFC 69–82); 2.9 km NW Surutato (JFC 69–85, 69–86); 1.6 km E Buenas Juntas (JFC 70–15, 70–16); Rancho El Madrono (JFC 71–21). *Sonora*: Sierra de Alamos (AMNH 104462); near Alamos (USNM 47536); stream near Sonora-Chihuahua border, above Alamos (MVZ 74187–90, 74198); Yecora (UAZ 35174, 28123); Sierra Alamos (UAZ 39507); 4.6–15.5 km SE Milpillas, Chihuahua (UAZ 39502–06); 18.6 km ESE Bamuri (LACM 121432).

Eumeces parvulus: MEXICO: *Colima*: 15 km NW Periquillo (UMMZ 80108). *Michoacan*: 1.6 km NE La Placita (UMMZ 104446); 1.6 km N Pomaro (UMMZ 104447, 2 specimens); 1.6 km WNW San Pedro Damian (UMMZ 104448, 3 specimens); 4.3 km E El Ticuiz (UMMZ 115093). *Nayarit*: 1.9 km N Santa Cruz (LACM 51566–67); between Matsuchan, Santa Cruz, and Tepic (USNM 147984); "Miniman" (USNM 51395)¹; Compostela (FMNH 94825–26); Tepic (USNM 56903). *Sinaloa*: Plomosas (USNM 47667); 4.8 km SE Plomosas (KU 91415, LACM 126983).

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RESUMEN

Taylor (1935) añadió dos especies de escincidos, *Eumeces parviauriculatus* y *E. parvulus*, al grupo *multivirgatus*. El análisis del diseño de la coloración y de la escamación del material de éstos y de otros taxones recientemente coleccionados en el noroeste de México, indican que estas especies pertenecen al grupo *brevirostris*. Con esta adición, el grupo *brevirostris* consta ahora de seis especies monotípicas y de una séptima, *brevirostris*, que es politípica y que posee cinco subespecies.

El grupo *brevirostris* puede distinguirse de otras especies y grupos de escincidos mexicanos porque sus representantes tienen mas ancha que larga la escama que bordea la parte media de la postgenial. Otras características útiles para diagnosticarlos son las siguientes: ausencia de la escama postnasal, presencia de una ligera raya medial y de una sola escama postmental. En este artículo se comparan y se resumen los detalles de la escamación, el desarrollo, la distribución y la ecología de *E. parviauriculatus*, *E. parvulus*, y *E. brevirostris bilineatus*.

Se sugiere que *E. copei* es la especie mas similar al tipo ancestral del grupo, y que de ella han derivado los distintos taxones del género. *E. parviauriculatus* ha cambiado muy poco a partir

de *copei*, mientras que *parvulus* presenta varios estados de caracteres derivados. Las especies de este grupo muestran su mayor diversidad en las regiones de las mesetas y de las montañas de Michoacán y Guerrero, y a partir de allí, su número se reduce en todas las direcciones.

Se revisa la historia de la nomenclatura y el estado taxonómico de *E. humilis*, miembro del complejo *multivirgatus-brevilineatus*. Se presentan datos que indican que *humilis* es un sinónimo del *E. callicephalus*.

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¹The locality "Miniman" cannot be located on maps or gazetteers. Apparently a typographic error is involved and the locality is probably Miramar, which is near where *parvulus* has been collected recently.

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